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FLEET MOORING BUOY SURFACE INSPECTION GUIDELINES

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AND CONSTRUCTION PROJECT OFFICE
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COMMAND
WASHINGTON, D.C. 20374

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FLEET MOORING BUOY SURFACE INSPECTION GUIDELINES

1.0 INTRODUCTION

1.1 Purpose and Use of Guidelines. These guidelines standardize fleet mooring buoy surface inspection procedures. They have been prepared to assist inspection personnel by defining what should be accomplished before and during a buoy inspection. Also defined are the types of data and documentation that must be submitted to the Commander, Naval Facilities Engineering Command (COMNAVFACENGCOM), after completion of the inspection. A step by step inspection checklist, contained in Appendix A, will be used during the inspection.

1.2 Background. COMNAVFACENGCOM is responsible for the operation and maintenance of all Navy fleet moorings. This includes procurement, installation, inspection, maintenance, and relocation of fleet moorings Navy-wide. Fleet moorings provide temporary or contingency berthing for fleet units in ports and harbors where pier space is limited or unavailable.

In support of COMNAVFACENGCOM's Fleet Mooring Program, the Chesapeake Division, Naval Facility Engineering Command (CHESNAVFAC-ENGCOM) has been assigned the responsibility to conduct periodic underwater inspections of fleet moorings worldwide (every 2 – 3 years). Based on the results of these inspections, the physical condition of each mooring is assessed. A determination is then made as to whether the mooring satisfactorily meets specified load and safety criteria, requires repair or refurbishment, or is unsatisfactory for further fleet use.

In order for CHESNAVFACENGCOM to properly monitor the condition of all mooring buoys, each Engineering Field Division (EFD) must supplement CHESNAVFACENGCOM's periodic inspections of fleet moorings with above-water

inspections of each buoy under their cognizance. These inspections should be conducted each year that a CHESNAVFACENGCOM underwater inspection is not performed.

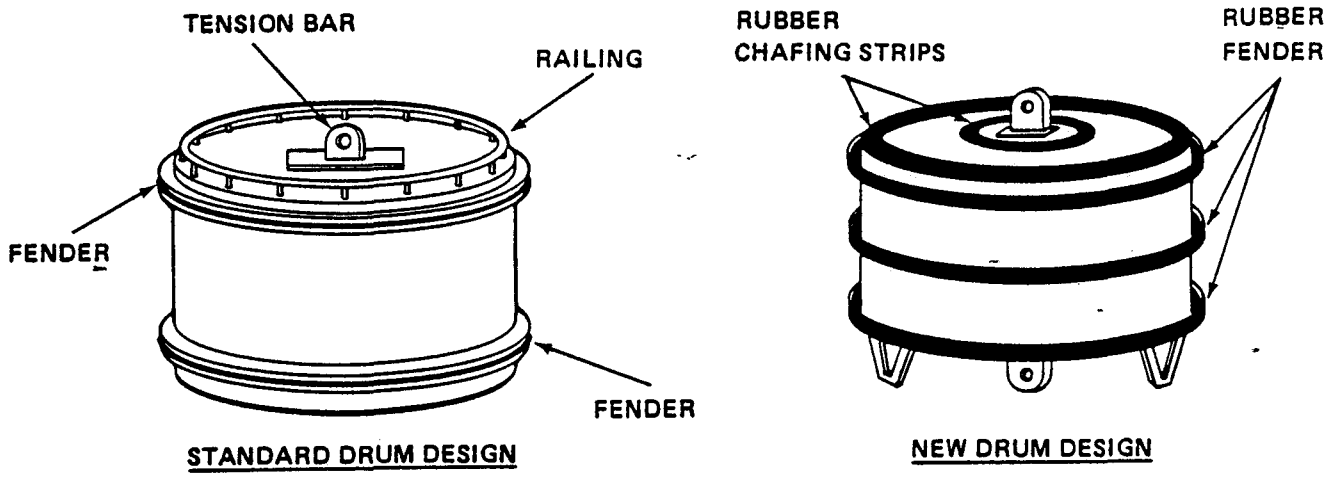
2.0 BUOY TYPES

The following types of buoys are currently utilized in fleet moorings (see Figure 1):

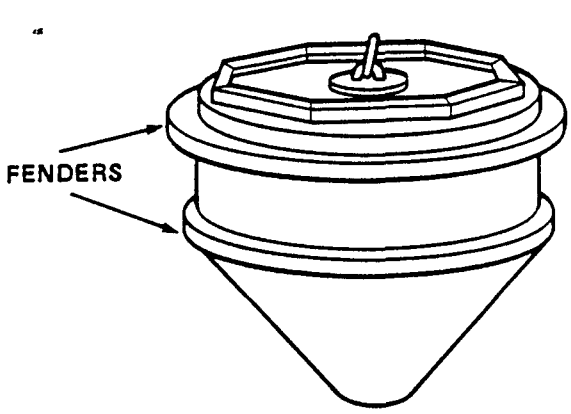
2.1 Drum Buoy. This buoy is normally made of steel and is available in a variety of sizes; it is primarily used in smaller classes of moorings. The shape of the buoy resembles a drum. The older standard design has a paint or fiberglass coating while the newer design has a polyurethane coating. This type of buoy contains either a tension bar or a hawsepipe.

- Tension Bar. A tension bar is a steel bar which passes through the center of the buoy with padeyes on top and bottom. The new foam buoy has a 10-inch diameter pipe used as a tension bar. The lower padeye is connected to the upper link of the riser chain. A moored vessel can be connected to the upper padeye by its anchor chain, wire rope, or mooring hawsers.

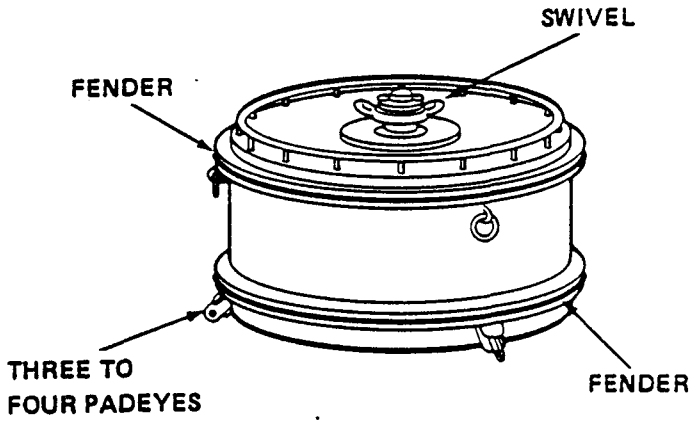
- Hawsepipe. A hawsepipe is a cylindrical tube passing through the center of the buoy. The riser chain is passed through this tube, and its upper link is held on the top of the buoy with a slotted chain plate. The lower portion of the riser chain within the hawsepipe is protected from wear by a rubbing casting which encircles the chain and greatly reduces the probability of chain abrasion. A moored vessel ties directly to the riser chain. The buoy is nonstructural in that the mooring load passes through the buoy via the riser chain.



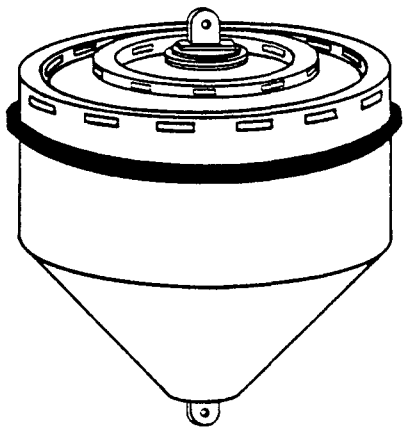
A. DRUM RISER-TYPE BUOY WITH TENSION BAR



B. PEG-TOP MARK II RISER-TYPE BUOY



C. DRUM NON-RISER TYPE (TELEPHONE) BUOY



D. NEW FOAM BUOY

Figure 1. Commonly Used Fleet Mooring Buoys

2.2 Peg Top Buoy. This buoy is also used to support riser-type moorings, and includes either a tension bar or hawsepipe. Peg top buoys are conically shaped, with the top deck area considerably larger than the bottom surface.

2.3 Nonriser-Type Buoy. These buoys are larger than those used in riser-type moorings since they have the additional weight of three or more ground legs to support in the water column. These buoys have a swivel at the top to which the moored vessel's anchor chain or hawser is attached. Three or four padeyes, to which the anchor leg assemblies are connected, are equally spaced around the buoy's hull.

2.4 Foam Buoy. This is the latest buoy design approved by the Navy. The buoy consists of a tension bar encompassed by a rigid, closed-cell, interior foam which is covered and adhered to by a flexible, cross-linked, polyethylene foam. The overall foam buoy is encased within a thick aliphatic urethane elastomer shell (a minimum of 3/4-inch).

3.0 BUOY INSPECTION PROCEDURES

3.1 Buoy Hull. The buoy shall be inspected to determine its general condition. The size of the buoy (diameter and height) shall be recorded along with its freeboard (The distance from the water line to the upper edge of the buoy hull). Physical damage such as holes, dents, or listing shall be reported. Listing is caused by off-center top jewelry or a loss of water tightness. Listing can be measured with the use of a simple inclinometer (See Appendix B).

3.2 Buoy Fenders/Chafing Strips. Most mooring buoys have one to three fenders mounted on the side of the buoy hull to reduce damage in the event of a collision with a vessel attempting to tie up to the mooring. In addition, most buoys have one or more chafing rails or strips attached to the buoy top. These rails prevent damage to

the top deck of the buoy by a ship's mooring chain. Figures 2 and 3 contain schematic drawings of different types of fender/chafing systems. The type, condition, and location of all fendering/chafing material shall be recorded.

3.3 Buoy Coatings. The vast majority of fleet mooring buoys have steel hulls. Most of these are covered with three to four coats of paint, but a considerable number have been primed and then covered with about a 3/16-inch fiberglass coating. Most recently, polyurethane coatings are being applied to some steel buoys to a thickness of approximately 3/16 of an inch. The polyurethane coatings feel more rubber-like than do the harder fiberglass coatings. If properly applied, fiberglass or polyurethane coatings can prevent rusting, reduce the subsequent deterioration of the buoy's hull, and prolong the buoy's operational life. The type and condition of the buoy coating shall be recorded. In addition, the number and location of the hatches shall be recorded and checked to see if they have been fiberglassed or polyurethane coated.

The new polyurethane-covered foam buoy has a dense outer elastomer shell which prevents water intrusion, and of course, is not seriously affected by those environmental conditions that cause steel buoys to rust and deteriorate. However, these buoys should be checked for tears or other damage to the elastomer skin and for proper condition of the buoy's reflective tape.

3.4 Buoy Top Jewelry. Top jewelry shall be measured with calipers to find the overall outside dimensions and areas of reduction in wire size. Where the top jewelry is slack, single link measurements should be taken as close to the wear zone as possible. When the top jewelry is under tension, double link measurements will be taken. Figure 4 shows the proper locations for taking single or double link

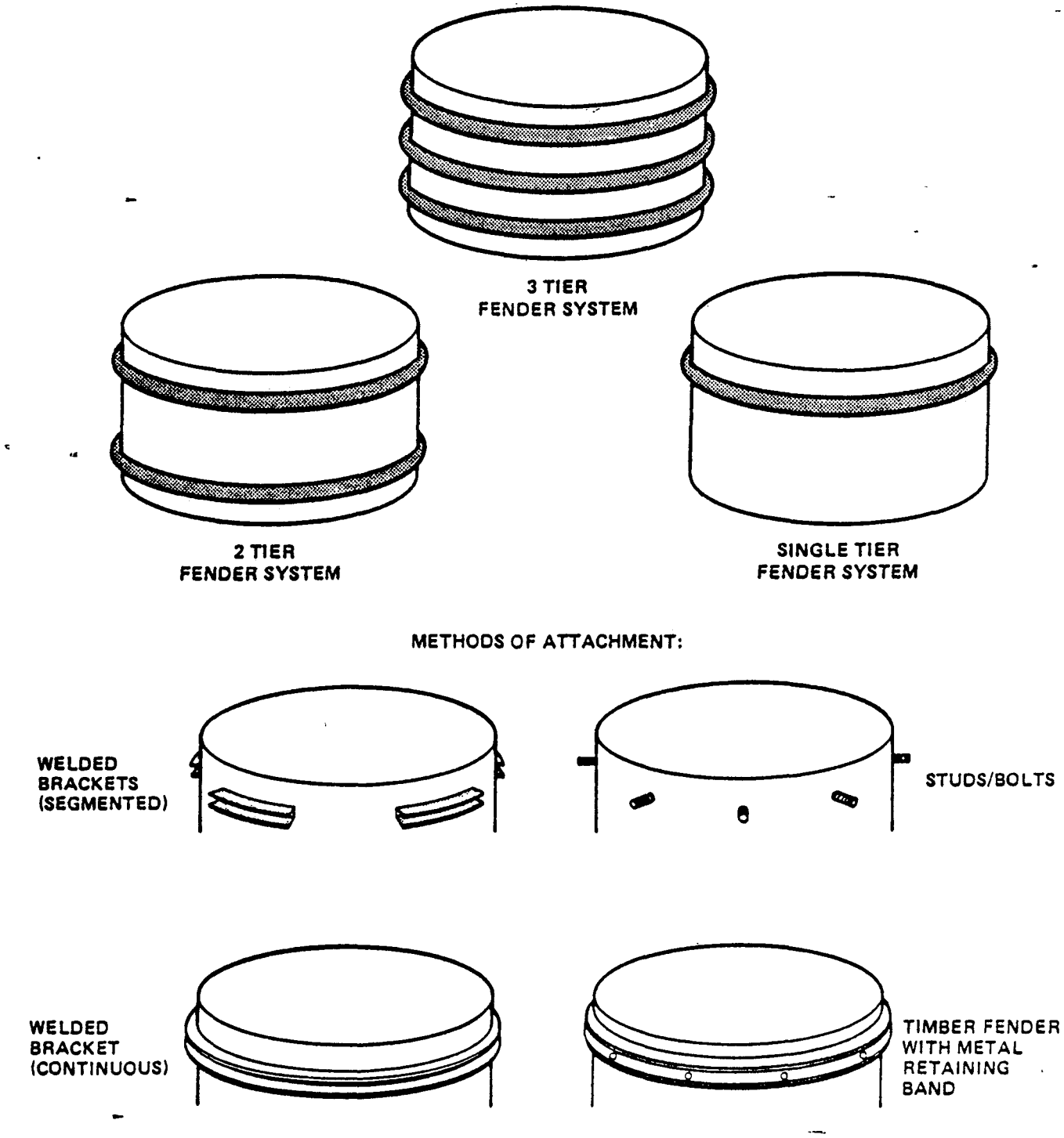
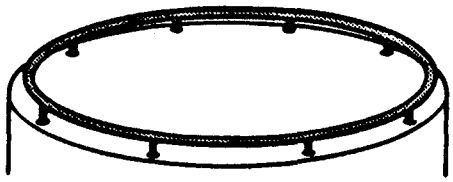
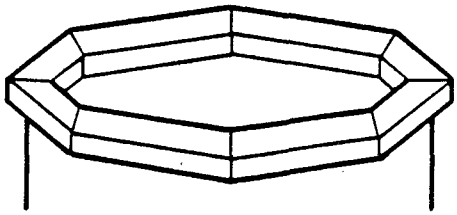


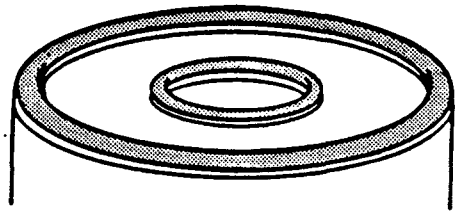
Figure 2. Fender Systems



CHAFING "RAIL"

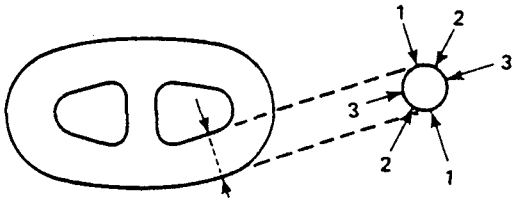


COMBINED FENDER AND
CHAFING STRIP (TIMBER)

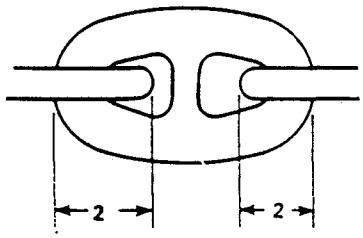


CHAFING "STRIPS"

Figure 3. Fender/Chafing Systems



SINGLE LINK MEASUREMENT



DOUBLE LINK MEASUREMENT

Figure 4. Locations for Taking Jewelry Measurements

measurements of the jewelry. The length of each component of the top jewelry should also be recorded. Each component should be identified, and a sketch made of its position relative to other components.

4.0 INSPECTION CHECKLIST

A detailed inspection checklist to be used during all surface inspections is contained in Appendix A.

APPENDIX A

INSPECTION CHECKLIST

FOR THE ABOVE-WATER PORTION

OF A BUOY

APPENDIX A

INSPECTION CHECKLIST FOR THE ABOVE-WATER PORTION OF THE BUOY

a. Overall Condition

- Record buoy type (Drum, Peg Top, etc.), (Section 2.0)
- Measure and record buoy diameter and freeboard to the waterline.
- Report any visible damage or listing. If the buoy is listing badly, it should be removed from the water and taken ashore to determine which inner compartment is leaking.
- Report the color and markings. Ensure that the identification number on the buoy is the same as that depicted on navigation charts; if not, report it.
- Record a brief objective view of the buoy's general condition.

b. Fiberglass Coating

- Report hull dents or separation of the fiberglass from the buoy. In the event that a buoy of this type is struck by a ship during mooring operations, both the fiberglass coating and steel hull can be indented. In many instances, however, the fiberglass will return to its normal shape and appear undamaged while the metal hull of the buoy remains indented.
- Report peeling or loose seams and/or edges. Fiberglass will often fail there first.

- Report any rust bleeding, as this indicates trapped moisture between the fiberglass and the buoy's hull.
- Report blisters, bubbles, cracks, checking, or glazing that may be hidden under paint.

c. Painted Surfaces

- Report spalling, cracking, peeling, and blisters.
- Report lack of full paint coverage of the buoy and/or paint discoloration due to chemical reactions or rust bleeding.

d. Polyurethane Elastomer Coated Foam Buoys

- Report damaged or torn elastomer skin.
- Report damaged reflective tape.

e. Top Jewelry

- Identify each component and prepare a sketch depicting their location within the top jewelry.
- Measure and record the length and wire diameter of each component. See Figure 4 for the proper locations for taking wire diameter measurements.
- Report any wear or corrosion of jewelry components.

f. Fenders/Chafing Strips

- Record the number and location of each (See Figures 2 and 3).

- Record the method of fender/chafing strip attachment (see Figure 2).
- Check for and report any loose, rusted, or broken attachments or bolts.
- Check the welds securing the fender/chafing strip mounting brackets to the buoy hull, and report any cracks or separation of the welding material from the parent metal.
- Ensure that drainage holes through the chafing strips are open and not clogged with debris.

(1) Timber Fenders/Chafing Strips

- Report any splintering, dry rot, worm/borer holes, or broken sections.
- Record paint type and condition.

(2) Rubber Fenders/Chafing Strips

- Check for and report any rubber brittleness or cracking.
- Record any tears, damage, or missing sections.

(3) Steel Pipe Chafing Rail

- Record pipe rail diameter and height above the deck.
- Check for rust and a secure attachment at the base of the stanchions, and check for rust on the underside of each horizontal rail.
- Record any damage such as dents, fractures, or loose parts in which a line may foul.

g. Manhole Covers

- Report the number, size, and location of each manhole.
- Report rusting of the covers and/or bolts. The edges of the covers may show a "delamination" of the steel.
- Check for and report any loose or missing bolts.
- On fiberglass-coated buoys, report whether the manhole covers are fiberglassed or not.

h. Tension Bar

- Check eye for wear, and measure its diameter with calipers. Some eye bars have a steel bushing inserted in the eye. If a bushing is present, check it for wear and measure the thickness of wear areas.
- Measure steel bar thickness.
- Check base plate for cracks, warping, or other damage.
- Record the eye plate thickness.

i. Hawsepipe

- Measure and record wire diameter and condition of the chain held in place by the retaining plate.
- Check for and report rusting or wear of the retaining plate.

j. Photographs

- Provide photographs of each buoy.

APPENDIX B

SIMPLE INCLINOMETER

HOW TO BUILD AN INCLINOMETER

1. CUT A PIECE OF PLYWOOD 1/4"x12"x16".
2. CUT A PIECE OF LUMBER 2"x4"x4'. NAIL PLYWOOD, CENTERED AND FLUSH WITH BOTTOM EDGE ON FLAT SIDE OF 2"x4"x4'.
3. ATTACH THIS SHEET TO PLYWOOD, SQUARED OFF TO TOP EDGE OF 2"x4"x4'.
4. DRIVE A NAIL AT CENTER POINT OF CIRCLE MARKED (+) ABOVE AND HANG A PLUMB BOB WITH POINT TOUCHING NUMBERS ON ARC.

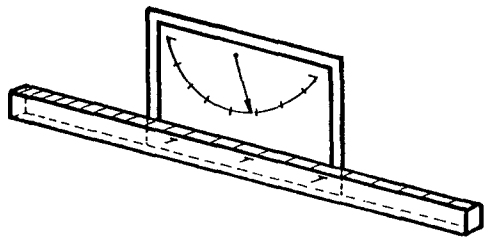


Figure B-1. Simple Inclinometer